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ABSTRACT

To determine if a relationship existed between physical skills and achievement in reading, mathematics, and listening comprehension of fifth-grade students, a study evaluated 334 fifth-graders in Starkville, Mississippi, on 20 physical fitness, motor fitness, and sports skills, as well as the Stanford Achievement Tests. The physical skills test battery included four measures of physical fitness (flexibility, muscular endurance, and muscular strength); eight measures of motor fitness (speed, agility, power, and dynamic and static balance); and eight items to assess the sports skills of baseball, basketball, soccer, badminton, and golf. The academic scores used were the total scores in reading, mathematics, and listening comprehension. Analysis revealed three physical measures--golf putting, left hand grip strength, and football kicking--which were common predictors for each of the three areas of academic achievement. The railwalk was a common predictor in the negative direction for each of the three areas. Findings support the view that results of relationship studies between academic ability and physical skills are conflicting. (Three tables of data are included.) (MM)

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A STUDY OF THE RELATIONSHIP BETWEEN PHYSICAL SKILLS AND ACHIEVEMENT IN LISTENING COMPREHENSION, MATHEMATICS, AND READING

Josey Templeton and Robbie Jones

During the past 25 years research has been conducted to establish the relationship between motor abilities and academic performance. Most results refute the direct relationship between perceptual motor activities and improvement in intelligence or academic achievement. However, the programs included often involved children with some kind of motor or perceptual deficit. There does seem to be a direct and essential influence of activity on the developing and aging nervous system, but research has not clearly established the extent of the dependence nor the kinds and amounts of activity most beneficial to growth and maintenance of the nervous system (Seefeldt & Vogel, 1986).

Tidwell (1975), Kneisley (1975), Tullo (1975), and Crow (1977) studied relationships between academic achievement and a variety of motor abilities in children in kindergarten through third grade. No significant relationships were found in the studies involving kindergarten and first grade students. The second grade students showed significant differences in the variables reading, language, total achievement, strength, and draw a line; the only significant predictor was motor skills for the criterion mathematics (Crow, 1977). In the relationship of motor ability with academic achievement, Tullo (1975) concluded that IQ and achievement related significantly to motor ability for his entire sample of third graders. With fourth graders, Vickers (1977) found that there were numerous statistically significant relationships, but the $\underline{r}$ 2 correlation coefficients were generally low.

Other studies have been done involving the relationships between a variety

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of motor abilities and academic abilities using several statistical methods. The results have been conflicting. Thomas and Chissom (1972) achieved more specific relationships by using canonoical correlation rather than multivariate techniques. They found that the relationship between perceptual-motor abilities and intellectual abilities decreased as age increased for preschoolers and early elementary school children. The Georgia Study (Harris & Jones, 1982) found a low but significant relationship between reading and mathematical abilities and selected motor performance vaiables among children in the second, fourth, and sixth grades. An ERIC Clearinghouse fact sheet (1983) stated that research shows a positive relationship between physical activity and academic achievement. Keller (1982) suggested that the difficulty in getting consistent results between motor abilities and academic abilities might be explained by the lack of consensus over the definition of physical skills and the correlational nature of the studies.

The Problem

The problem in this study was to determine if a relationship existed between physical skills and achievement in reading, mathematics, and listening comprehension of fifth grade students.

Research Procedures

During 1986 and 1987, 334 fifth grade students in the Starkville School District were evaluated on twenty physical fitness, motor fitness, and sports skills as well as the Stanford Achievement Test. The physical skills test battery included four measures of physical fitness--flexibility, muscular endurance, and muscular strength; eight measures of motor fitness--speed, agility, power, dynamic balance, and static balance; and eight items to assess the sports skills of baseball, basketball, soccer, badminton, and golf. The academic scores used were the total scores in reading, mathematics, and

listening comprehension.

Data Analysis

Test data were analyzed through the use of mean scores on the physical skills and national percentile ranks on academic achievement. Positive or negative achievement was predicted through the use of a regression analysis model.

Results of the Study

Tables 1 - 3 summarize the results of the stepwise, multiple regression anlysis of the selected physical skills measures. The railwalk test and the basketball dribble are functions of time, therefore, an increase in the mean indicated a decrease in performance.

Table 1 summarizes that achievement in total listening was predicted by golf putting, left hand grip strength, railwalk, broad jump, basketball throwing, basketball lay-ups, basketball dribbling, bean bag target throwing, and football kicking.

Table 2 summarizes that achievement in total mathematics was predicted by golf putting, railwalk, Stork stand for static balance, left hand grip strength, basketball catching, football kicking, tee ball batting, basketball lay-ups, and broad jump.

Table 3 summarizes that achievement in total reading was predicted by railwalk, left hand grip strength, golf putting, sit and reach flexibility, football kicking, tee ball batting, and basketball catching.

Discussion

There were three physical skills measures which were common predictors in a positive direction for each of the three areas of academic achievement. The skills were golf putting, left hand grip strength, and football kicking. The railwalk was a common predictor in the negative direction for each of the three

areas of academic achievement.

Significant positive correlations between academic achievement and the physical skills might have been expected in the golf putt and the football kick. The golf putt involved instruction on how to hold the putter, putting onto a carpet marked with a target "hole" and numbered spaces which increased in value the closer the ball stopped to the "hole", and the use of novel equipment. The football kick involved basic foot-eye coordination and the gross motor skill of kicking a nerf football off a tee for distance from a short approach. Since the railwalk is a measure of dynamic balance and lengthy explanation, it might be expected that more academically success oriented children would be more precise in walking the rail in a heel-to-toe fashion and less concerned with speed. The puzzling correlationship is that of left hand grip strength. The mean score for right hand grip strength was slightly higher than the mean score for left hand grip strength, yet, there was low correlation between right hand grip strength and each of the academic achievement measures.

These findings support the view that results of relationship studies between academic ability/achievement and physical skills are conflicting. This particular research indicates that golf putting, football kicking, railwalking, and left hand grip strength are predictors of academic achievement in total listening, total mathematics, and total reading. Further research needs to be done measuring the same mental and physical abilities at different ages. But until more research is done, the inclusion of activities for manipulating a long-handled implement, kicking, grip strength, and dynamic balance might be considered in physical education curriculum planning because of their potential influence on academic achievement.

Table 1

Regression Statistics Showing Relationships of Selected Variables to the Total Listening Score on the Stanford Achievement Test

Variable Entered	Multiple R	R2	Increase in R2	F Value to Enter
Golf Putt	.203	.041	.041	14.315**
Left Grip	.242	.059	.017	6.040**
Railwalk	.267	.071	.013	4.565**
Broad Jump	.285	.081	.010	3.605*
B Ball Throw	.300	.090	.008	2.997*
B Ball Dribble	.319	.102	.012	4.371**
B Ball Layups	.330	.109	.007	2.538*
Target Throw	.340	.116	.006	2.563**
F Ball Kick	.357	.127	.005	1.921*
Other Variables Combined	.378	.143	.000	

*p .05
**p .01

Table 2

Regression Statistics Showing Relationships of Selected Variables to the Total Mathematics Score on the Stanford Achievement Test

Variable Entered	Multiple R	R2	Increase in R2	F Value to Enter
Golf Putt	.263	.063	.069	24.709**
Railwalk	.324	.105	.036	13.221**
Stork Stand	.349	.122	.017	6.337**
Left Grip	.397	.158	.013	5.021**
B Ball Catch	.415	.172	.014	5.536**
F Ball Kick	.428	.183	.011	4.350**
T Ball Bat	.440	.193	.010	4.194**
B Ball Layups	.449	.202	.009	3.478**
Broad Jump	.465	.217	.005	2.172*
Other Variables Combined	.483	.233	.000	

*p .05
**p .01

Table 3

Regression Statistics Showing Relationships of Selected Variables to the Total Reading Score on the Stanford Achievement Test

Variable Entered	Multiple R	R2	Increase in R2	F Value to Enter
Railwalk	.246	.061	.061	21.458**
Left Grip	.330	.109	.048	17.782**
Golf Putt	.389	.152	.043	16.727**
Stork Stand	.420	.177	.013	5.205**
F Ball Kick	.458	.210	.010	4.296**
T Ball Bat	.468	.219	.009	3.922**
B Ball Catch	.477	.227	.005	3.332**
Other Variables	.507	.257	.000	

*p .05
**p .01

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